Facilities Study Report

For

Physical Interconnection of

PJM Generation Interconnection Request Project ID AG2-420

"Eclipse #2 34.5 kV"

Introduction

This Facilities Study has been prepared in accordance with the PJM Open Access Transmission Tariff, as well as the Application and Studies Agreement between the Project Developer and PJM Interconnection, LLC (PJM or Transmission Provider (TP)). The Transmission Owner (TO) is Mid-Atlantic Interstate Transmission, LLC (as agent for FirstEnergy Pennsylvania Electric Company).

This Facility Study was performed to satisfy the Phase 2 Facility Study requirement of the PJM Tariff. The Facility Study is intended to provide scope, cost and schedule estimates for the project as currently defined and approved for Phase 2 study. In the event project changes are made during Decision Point 2 (DP2) that impact this report, updates will be provided as part of the Phase 3 report. Following execution of the project's final agreement, this report will not be updated to account for other changes made as part of the agreements modification clause and instead the scope change process will be followed.

A. Transmission Owner Facilities Study Summary

1. PROJECT DESCRIPTION

The Project Developer (PD) has proposed a Solar Generating Facility located in Venango County, Pennsylvania with a designated PJM Project ID of AG2-420. The installed facilities will have a total Maximum Facility Output (MFO) of 25 MW with 14 MW of this output being recognized by PJM as Capacity.

2. POINT OF INTERCONNECTION (POI)

The Generating Facility will interconnect with MAIT via tapping the Eclipse #2 34.5 kV, between Glen Fern and Eclipse 34.5 kV Substations.

The proposed generation interconnection is shown on the single line diagram in Attachment #1.

3. POINT OF CHANGE IN OWNERSHIP (PCO)

The Point in Change of Ownership will be located at the last Project Developer-owned structure near the tap pole 2704251.

4. SCOPE OF PROJECT DEVELOPER INTERCONNECTION FACILITIES

Project Developer will design, build, own, operate and maintain the Project Developer Interconnection Facilities on Project Developer's side of the PCO. This includes, but is not limited to:

- Circuit breakers and associated equipment located between the high side of the GSU and the PCO.
- Generator lead line from the Generating Facility to the PCO.
- Relay and protective equipment, and Supervisory Control and Data Acquisition (SCADA) and telecommunications equipment to comply with the TO's Applicable Technical Requirements and Standards

B. Transmission Owner Facilities Study Results

The following is a description of the planned Transmission Owner facilities for the physical interconnection of the proposed AG2-420 project to MAIT transmission system. These facilities shall be designed according to MAIT Applicable Technical Requirements and Standards. Once built, MAIT will own, operate, and maintain these Facilities.

1. TRANSMISSION OWNER INTERCONNECTION FACILITIES:

1.1 Eclipse #2 34.5 kV Line Tap

Replace existing structure 2704251 with (1) new Tap pole. Install (1) new dead-end pole for line recloser and radio mounted equipment on developer parcel. Provide up to 200 feet of conductor between the new tap structure 2704251 and the developer PCO structure, extending the circuit 00512-51.

- Existing Conditions
    - ACSR 4/0, Glen Fern Circuit 00512-51, 19.9kV/34.5KV
    - Wood Poles installed in 1974, 45' height
- Installations
    - Install (1) dead-end structure for line recloser and radio mounted equipment on developer parcel.
    - Install (1) tap structure
    - Install 200’ of conductor for Tap line
    - Install Recloser and update recloser settings
    - Install 700 MHz Radio System
- General Assumptions
    - New Poles are wood direct embed
    - No guying needed
    - Conductor for new line to match existing
    - 0.07 Miles of forestry needed
    - 0.27 Acre of ROW included
    - No access road/work pads required
    - No siting required
    - Environmental Permitting needed
- Ancillary Scope of Work
    - Project Management
        - Provide project management, coordination, administration, scheduling, material management and project development if required.

1.2 AG2-420 Generation Facilities

Energize and integrate generator interconnection facilities to the transmission system.

- Relay and Controls Scope of Work
    - Integrate interconnection facilities protection and controls to the transmission system.
- Ancillary Scope of Work
    - Project Management
        - Project management will be required for this asset.
    - Revenue Metering
        - Metering is provided by MAIT.
    - Testing and Commissioning
        - Testing and commissioning services as required for revised relay settings.

2. STAND ALONE NETWORK UPGRADES

None.

3. NETWORK UPGRADES

3.1 Eclipse Substation

- Relay & Control Scope of Work
    - Review and update relay settings
- Scope of Work Assumptions:
    - None
- Ancillary Scope of Work
    - Project Management
        - Provide project management, coordination, administration, scheduling, material management and project development if required.
    - Testing and Commissioning
        - Testing and commissioning services as required for revised relay settings.

3.2 Glen Fern Substation

- Relay & Control Scope of Work
    - Review and update relay settings
- Scope of Work Assumptions:
    - None
- Ancillary Scope of Work
    - Project Management
        - Provide project management, coordination, administration, scheduling, material management and project development if required.

- Testing and Commissioning
    - Testing and commissioning services as required for revised relay settings.

4. OTHER SCOPE OF WORK

4.1 Revenue Metering

- Install 34.5 kV revenue metering at Project Developer's structure.

5. MILESTONE SCHEDULE FOR COMPLETION OF MAIT WORK

Facilities outlined in this report are estimated to take 20 months to be constructed, from the time the Generation Interconnection Agreement is fully executed. This schedule may be impacted by the timeline for procurement and installation of long lead items, the ability to obtain outages to construct and test the proposed facilities.

Description	Start Month	Finish Month
Preliminary Engineering	1	2
Siting, Permitting & Real Estate	5	12
Detailed Engineering	3	12
Equipment Delivery	14	14
Construction	15	16
Testing and Commissioning	17	20

6. ASSUMPTIONS IN DEVELOPING SCOPE/COST/SCHEDULE

6.1 Scope Assumptions

- Project Developer will coordinate design and alignment of proposed 34.5 kV generator lead line with the Transmission Owner for review of any clearance, right-of-way or right-of-way encroachment issues with TO owned facilities.
- Project Developer will coordinate design and construction of proposed 34.5 kV lead line. For these areas, the Project Developer shall provide TO with proposed drawings prior to construction and as-built drawings, confirmed by as-built survey data post-construction.
- Transmission Owner's preference would be to limit interference and avoid transmission line crossings with new 34.5 kV terminal positions. As a minimum, Project Developer facilities should not encroach within 100 feet of TO centerline at blowout conditions. If Project Developer's line design does not comply with this requirement, TO would need to review this area as a special exception.
- Additional costs will be incurred by the Project Developer, if final alignment of the 34.5 kV generator lead line causes encroachments, changes, or modifications to any existing or relocated TO facilities.
- Project Developer is responsible for making all arrangements for electric distribution service (if required) for its generation station. No costs or schedule are included herein.
- All new generator only and new generator plus load facilities must be isolated from the MAIT Transmission System by a Power Transformer with a winding configuration meeting the requirements in FirstEnergy's "Requirements for Transmission Connected Facilities" document.

- Revenue metering equipment. Current and voltage transformers shall be installed on the high voltage side of the GSU, on the generation side of the fault-interrupting device, and within the local zone of fault protection for the facility.

6.2 Cost Estimate Assumptions

- The cost estimates provided for this project were developed as of March 2026, based upon current market conditions. Hence, they are subject to significant changes in the event that project implementation is delayed. Notwithstanding the cost estimates from this report being used in the Generator Interconnection Agreement for the related project, MAIT reserves the right to re-evaluate and provide a more accurate cost estimate during the implementation phase of the project. In accordance with section 217 of the Open Access Transmission Tariff, the Project Developer will be responsible for 100 percent of the actual costs of the facilities required to accommodate its Interconnection Request.
- MAIT reserves the right to charge the Project Developer operation and maintenance expenses to maintain the Project Developer attachment facilities, including metering facilities, owned by MAIT. These costs will be specified in the Generator Interconnection Agreement.

6.3 Schedule Assumptions

- This schedule assumes that all issues covered by the "Environmental, Real Estate and Permitting Issues" section of this document are resolved. Construction cannot begin until after all applicable permits and/or easements have been obtained.
- FE PEN's ability to support this schedule also depends on the feasibility of taking the required outages to support construction. Outages that are determined to negatively impact system reliability or cause congestion may be delayed or denied, at any time, even if they are submitted on time based on the Outage Submittal Rules in section 4.2.1 of PJM Manual 03. This includes, but is not limited to, outages requested between the months of June and September, as well as January and March, which typically get denied due to summer and winter peak conditions. Therefore, the construction schedule will be adjusted as needed to accommodate any outage restrictions that have been identified by FE PEN or the Transmission Provider.

7. REVENUE METERING REQUIREMENTS

All revenue metering needed for this interconnection project must meet the metering requirements stated in Appendix 2, section 8 of the AG2-420 GIA, and in PJM Manuals M01 and M14D. The details of applicable revenue metering requirements are given in the "Requirements for Transmission Connected Facilities" posted on PJM website.

The revenue metering will be installed on the Transmission Owner side of the Point of Change in Ownership, and will be installed, owned, and maintained by Transmission Owner.

The revenue metering system (particularly the revenue metering current transformers) shall be designed to accurately meter the light loads that will occur when the facility is not generating power and only back-feeding station service from the Transmission Owner. This may require the use of high accuracy extended range current transformers.

Transmission Owner will obtain real-time, site-specific, generation data from PJM, via the required communication link from Project Developer to PJM. Transmission Owner will work with PJM and Project Developer to ensure the generation data provided to PJM meets Transmission Owner's requirements.

These requirements are in addition to any metering required by PJM.

8. LAND REQUIREMENTS FOR INTERCONNECTION SUBSTATION

Not Applicable.

9. APPLICABLE TECHNICAL REQUIREMENTS AND STANDARDS

The Requirements for Transmission Connected Facilities, Revision 7, dated January 27, 2026, shall apply.

The TPP-REF-003 Transmission Planning Criteria, Revision 10, dated December 19, 2023, shall apply.

10. ENVIRONMENTAL AND PERMITING

The following are possible environmental, real estate and permitting issues:

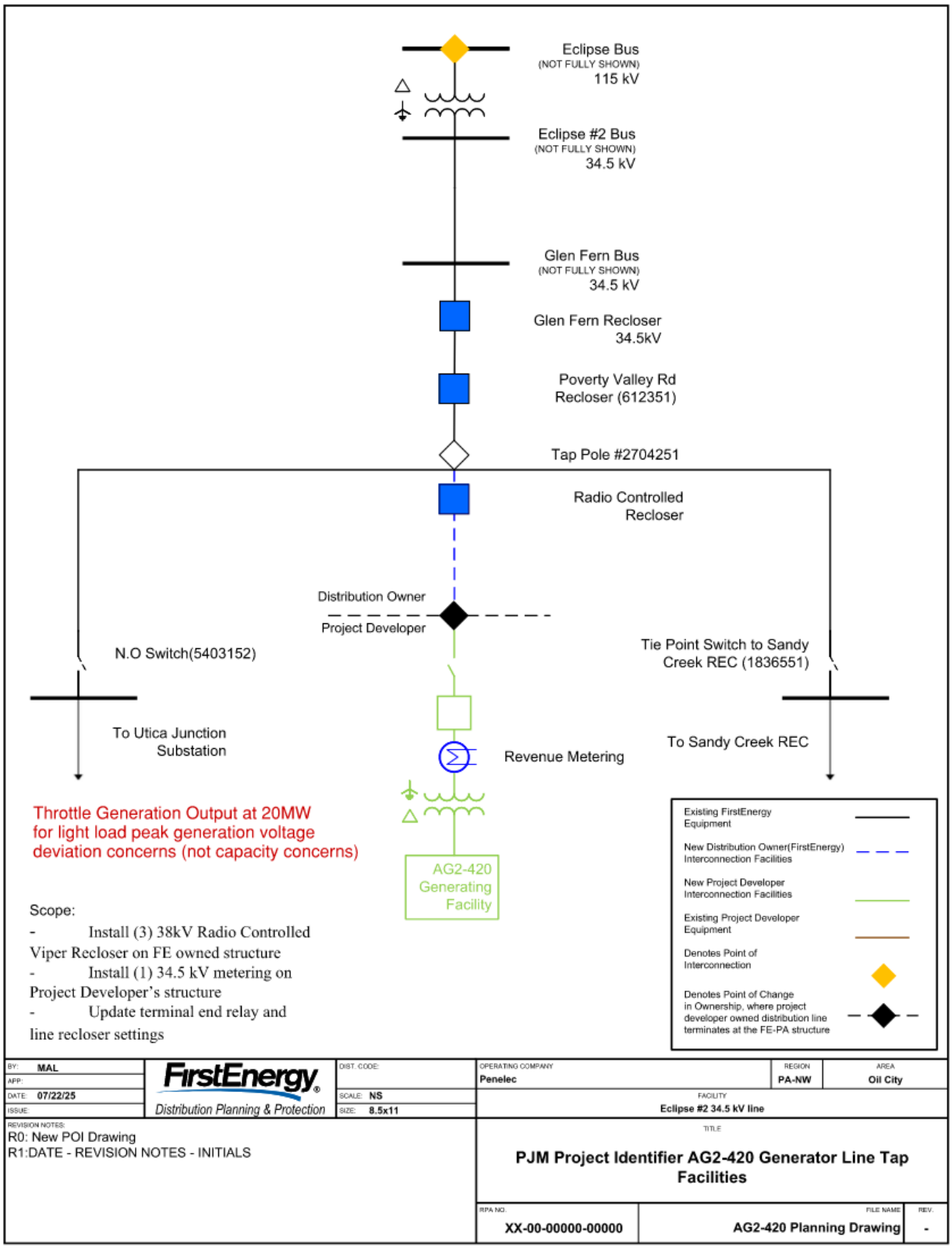
- Environmental permitting, Real Estate acquisition, and notifications to the state's Public Utilities Commission (PUC) vary, some up to twelve (12) months after preliminary engineering is completed to secure the required approvals.
- Prior to agreement by Project Developer to purchase the property, a Phase 1 Environmental Assessment should be conducted for the entire site to avoid assumption of environmental liabilities by Project Developer or Transmission Owner.
- The Transmission Owner interconnection substation may involve environmental surveys, permits, approvals and plans with federal, state, and/or local agencies.
- Assumed Project Developer is to provide all access rights, easements, ROW and permits necessary to complete the Project to the satisfaction of Transmission Owner. Environmental permitting shall encompass all federal, state, and local requirements, consultations, and agency coordination. Confirmation of meeting all permitting requirements shall be provided to Transmission Owner, prior to start of construction. Following construction and energization, confirmation of permit closeout shall be provided to the satisfaction of Transmission Owner, prior to transfer of ownership. If any of these elements are not included in the final agreement between Transmission Owner and Project Developer, twelve (12)-to-eighteen (18) months should be added to the Project Schedule to secure necessary permits, and additional costs would apply.
- Project Developer will provide copies of all the relative environmental permits and other necessary approvals to Transmission Owner before Transmission Owner accepts the interconnection facilities.

- Project Developer is required to install an access road from the new interconnection substation to the nearest public road (must be approved by Transmission Owner) and obtain access rights for Transmission Owner. Project Developer is responsible for maintaining access road and always ensures unimpeded access for Transmission Owner.
- Project Developer is responsible for all property acquisition (including easements/rights-of-way (ROW)) for transmission, distribution and communication facilities needed for the generator interconnection.
- If Project Developer owns the project property, in fee title, Transmission Owner will require a fee property transfer for the interconnection substation site which may require subdivision approval, together with permanent access rights to and from the substation, as well as a perpetual easement for any transmission lines to the substation. Project Developer is responsible for all costs, including but not limited to subdivision, associated with the property transfer.
- If Project Developer leases the project property, the Project Developer will be required to obtain fee property from the underlying fee property owner, on behalf of Transmission Owner, for the interconnection substation site, together with permanent access rights to and from the substation, as well as a perpetual easement for any transmission lines to the substation.
- All property rights must be surveyed and metes and bounds descriptions prepared for incorporation into Transmission Owner's document forms, for transfer of title.
- The Transmission Owner interconnection substation and transmission line loop will involve PUC notification/approval.
- All work occurs within an existing transmission line right-of-way or on Project Developer's property with access to all existing structures possible via that property and the right-of- way following established access routes that do not cross wetlands or streams.
- Project Developer will develop, and secure regulatory approval for, all necessary Erosion and Sediment Control (E&SC) plans and National Pollutant Discharge Elimination System (NPDES) permits.
- Project Developer will obtain all necessary permits.
- Project Developer will conduct all necessary wetlands and waterways studies and permits.
- Project Developer will conduct all necessary historical and archaeological studies.
- If the Project Developer plans to cross the transmission line right of way with facilities or access roads, please refer to the Transmission Rights-of-Way Restrictions information located at:

  https://www.firstenergycorp.com/help/safety/real-estate-power-lines/transmission-right-of-way.html#ROWform

C. APPENDICES

ATTACHMENT #1: SINGLE LINE DIAGRAM FOR PHYSICAL INTERCONNECTION



ATTACHMENT #2: DISTRIBUTION PROTECTION REQUIREMENTS

SHORT CIRCUIT DATA (Symmetrical Values Only) **- NORMAL CONFIGURATION**

	Glen Fern	**SLG**	**3 Phase**
34.5 kV	Z1 = 1.28086+ j4.71135 ohms Z0 = 2.32785+ j8.40330 ohms	1077A	4079A

PROJECT SCOPE

The AG2-420 25.0MW generation will interconnect with the FirstEnergy distribution system via a tap on the Glen Fern substation 34.5 kV Polk circuit #00512-51 at pole #2704251. FirstEnergy performed an analysis of its distribution system. The AG2-420 did not contribute to any overload on the substation system. Replace Glen Fern 34.5kV Polk relay equipment (this scope is part of the distribution reinforcement Network Upgrade – TC2-PN-AG2-420.b). Modify relay settings (SEL-351) at Eclipse 34.5kV Glen Fern.

EQUIPMENT AT GLEN FERN:

1. Existing Polk Cooper Form 4C Type RXE recloser (hydraulic)

EQUIPMENT AT Eclipse:

1. Existing 34.5 kV Transformer#2 circuit breaker rated 34.5kV 2500A 20kA
2. Existing Glen Fern SEL-351 Phase, ground Overcurrent Relay
3. Existing 34.5 kV Glen Fern circuit breaker rated 34.5kV 1200A 20kA

DIRECT TRANSFER TRIP NOTES

The interconnection proposal will require Developer to meet applicable "Technical Requirements" as outlined in First Energy's document titled “Technical Requirements for the Interconnection of Customer-Owned Generation to the FirstEnergy Distribution System". Anti-islanding system shall meet IEEE 1547 and UL 1741 Therefore no Direct Transfer Trip (DTT) will be required.

METERING

- One SEL-735 power quality meters per relay upgrade. Part number: 0735BX209__EFXXXXX26101XX (2 2 for 48VDC, 4 4 for 125VDC) Meter used for panel indication and to supply analog data to the substation RTU. SCADA points list revision E shall be utilized.

ATTACHMENT #3: TRANSMISSION PROTECTION REQUIREMENTS

Generator Protection Requirements

- All proposed generation interconnection points and load-serving delivery points from the transmission system must comply with the technical requirements detailed in the FirstEnergy "Requirements for Transmission Connected Facilities" document.

The Project Developer is solely responsible for protecting its own equipment in such a manner that electrical faults or other disturbances on the FE transmission system do not damage its equipment.

FE Protection Requirements

At the remote FirstEnergy Substation:

- Eclipse substation was found to have adequate intertie protection to detect and isolate the generation for ground faults on the FirstEnergy transmission system. As a result, no additional relays or equipment are required for this condition.
    - FirstEnergy will determine if it is still necessary to install intertie relaying on the low side of the 115/34.5 kV No 1 distribution transformer, the 115/43.5 kV No 2 distribution transformer, the 34.5 kV CPT West (00506-51) distribution circuit, the 34.5 kV Glen Fern (EGF) distribution circuit, or at the solar generation location.
    - FirstEnergy is responsible to provide the cost estimate of the installation of any new intertie relaying and its appurtenances. FirstEnergy will be responsible for the costs of any wiring or setting changes to ensure there is no back feed into the transmission system.
- All relays, relay schemes, and relay settings that include transmission voltages or currents or trip any transmission voltage circuit breakers shall require the review and approval of FirstEnergy.
- FirstEnergy will complete detailed relay coordination studies to identify off-site relay setting changes required due to this generation interconnection. This may result in additional individual relay replacements being required. These relay replacements will be done at the cost of FirstEnergy.

Short Circuit Data

The short circuit levels at the Eclipse 115 kV bus are the following:

Short Circuit values at 115 kV

Three phase faults = 9.4 kA
Single line to ground fault = 6.8 kA

Transmission System Impedances at 115 kV, 100 MVA base

Positive sequence Z1 = (0.00796 + j 0.05273) (per unit)
Zero sequence Z0 = (0.02699 + j 0.10853) (per unit)

The fault currents provided are bolted, symmetrical values for present, normal transmission system conditions. Future increases in fault currents are possible, and it is the Project Developer's responsibility to upgrade their equipment and/or protective equipment coordination when necessary. No generation assets were modeled.